

**NASA SCIENCE MISSION DIRECTORATE**

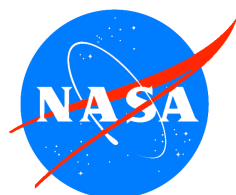
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*Earth-Sun System Applied Sciences Program  
Ecological Forecasting Program Element  
FY2006-2010 Plan*



Version: FINAL DRAFT

Date: 6/30/2006



*Expanding and accelerating the realization of economic and societal  
benefits from Earth-Sun System science, information, and technology*

**NASA Science Mission Directorate**  
**Earth-Sun System Division**  
**Applied Sciences Program**

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*Applied Sciences for the Ecological Forecasting Program Element:*

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This document contains the Ecological Forecasting Program Element Plan for FY 2006-2010.

This plan derives from direction established in the NASA Strategic Plan, Earth Science Enterprise and Space Science Enterprise Strategies, Earth Science Applications Plan, and OMB/OSTP guidance on research and development. The plan aligns with and serves the commitments established in the NASA Integrated Budget and Performance Document.

The Program Manager and the Applied Sciences Program Leadership have reviewed the plan and agree that the plan appropriately reflects the goals, objectives, and activities for the Program Element to serve the Applied Sciences Program, Earth-Sun System Division, NASA, the Administration, and Society.

(Signature on file)

\_\_\_\_\_  
William W. Turner  
Program Manager, Ecological Forecasting  
Applied Sciences Program  
NASA Earth-Sun System Division

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Date

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Date

NASA Earth-Sun System Division: Applied Sciences Program

TABLE OF CONTENTS

**I. PURPOSE AND SCOPE .....1**

**II. GOALS AND OBJECTIVES .....2**

**III. PROGRAM MANAGEMENT AND PARTNERS ..... 3**

**IV. DECISION SUPPORT TOOLS AND MANAGEMENT ISSUES ..... 7**

**V. APPLICATION ACTIVITIES ..... 11**  
    **ADDITIONAL ACTIVITIES & LINKAGES ..... 17**

**VI. BUDGET: FY06-2010 ..... 18**

**VII. PROGRAM MANAGEMENT AND PERFORMANCE MEASURES .....19**

**VIII. APPENDICES .....20**

**A. INTEGRATED SYSTEM SOLUTIONS DIAGRAM ..... 20**

**B. ROADMAP.□ ..... 21**

**C. APPLIED SCIENCES PROGRAM BUDGETS FY2006-2010 ..... 23**

**D. RELATED NASA AND PARTNER SOLICITATIONS AND GRANTS ..... 24**

**E. ACRONYMS AND WEBSITES ..... 39**

## NASA Science Mission Directorate – Applied Sciences Program

### *Ecological Forecasting Program Element Plan: FY 2006 - 2010*

#### **I. Purpose and Scope**

This Applied Sciences National Applications Program Element Plan is applicable for Fiscal Years 2006 through 2010. The plan documents the purpose of the program and the implementation approach to meet the program objectives using the allocated resources. The plan describes the program element approach in extending NASA Earth-Sun system science research results to meet the decision support requirements of partner agencies and organizations. The Applied Sciences Program requires this plan to function as a program management tool, describing the program structure, functional mechanisms, performance measures, and general principles that will be followed in extending NASA research results for societal benefits.

##### *Scope within NASA and Applied Sciences Program*

Each National Applications Program Element is managed in accordance with, and is guided by, the NASA Strategic Plan and Earth Science Applications Plan. The program element benefits from NASA Earth-Sun system science research results and capabilities, including the fleet of NASA research satellites, the predictive capability of models in the Earth System Modeling Framework (ESMF), Project Columbia, the Joint Center for Satellite Data Assimilation (JCSDA), and the Earth-Sun System Gateway (ESG). The Applied Sciences Program seeks to develop with its partners scientifically credible integrated system solutions in which uncertainty characterization and risk mitigation has been performed using the capability of the national Earth-Sun laboratories and others in the community of practice.

The FY06 President's Budget for the NASA Applied Sciences Program specifies between \$48 million and \$55 million annually for FY06 – FY10. There are two elements to the Applied Sciences Program: National Applications and Crosscutting Solutions. Each National Applications Program Element benefits from the performance results of Crosscutting Solutions (see Crosscutting Solutions Program Element Plan). Each National Applications Program Element leverages and extends research results from the over \$2 billion per year supporting Earth-Sun system science and development of innovative aerospace science and technology. Additional information about the NASA Applied Sciences Program can be found at <http://science.hq.nasa.gov/earth-sun/applications>.

The Ecological Forecasting Program Element is one of twelve elements in the Science Mission Directorate Applied Sciences Program. NASA and the Applied Sciences Program collaborate with partner organizations to enable and enhance the application of NASA's scientific research results to serve national priority policy and management decision support tools. The desired outcome is for partner organizations to use project results, such as prototypes and benchmark reports, to enable expanded use of Earth science products and enhance their decision support capabilities.

Ecological forecasting is an important scientific paradigm for the 21st Century. It uses Earth observation data

and models to predict the impacts of environmental change on the ecosystems that support the existence of life on Earth. It also links the physical world of climate and geology to the living world of biology and ecology. As the Committee on Environment and Natural Resources (CENR) of the President's National Science and Technology Council said in its call for improved ecological forecasts, "Ecological forecasts predict the effects of biological, chemical, physical, and human-induced changes on ecosystems and their components." Indeed, ecological forecasting requires a scientific synthesis across the domains of physics, geology, chemistry, biology, and psychology. The goal is reliable forecasts that allow decision makers access to science-based tools in order to project changes in living systems. These forecasts should incorporate knowledge of uncertainties and estimates of error and allow those making decisions to compare the outcomes of alternative policies. Analogues from the physical sciences include short-term weather forecasts and longer-term predictions of climate phenomena, such as El Nino events.

Such forecasts are important to those attempting to promote economic growth while still sustaining the natural ecosystems that provide us with cost-free services, such as clean air, fresh water, biodiversity, fertile soils, and the removal of waste products. Forecasts allow planners, developers, and resource managers to project the impacts to ecosystems of their actions, as well as the effects of other phenomena such as major storm events. From the perspective of the NASA Applied Sciences Program, ecological models ingest data resulting from NASA research observations and measurements and generate forecasts for decision support systems (DSS) developed by NASA's partners. These models may span spatial scales from molecular to global. They may also assimilate information across long time scales to hone and test the accuracy of predictions. There are limits to our forecasting ability but discovering the reasons for these limits enhances our overall understanding of the ecosystems involved. NASA is currently involved in both international and domestic partnerships under the Ecological Forecasting Program Element.

A topic as broad as ecological forecasting requires the establishment of priorities. An overarching priority for the Ecological Forecasting Program Element is the growing number of DSS addressing the conservation of biodiversity. These decision support tools are proliferating in the government, not-for-profit, academic, and private sectors. This proliferation is at least partly in response to concerns raised by researchers that extinction rates for certain groups of organisms now equal those occurring during mass extinction events documented in the geologic record. The World Conservation Union (IUCN) has been tracking the status of species and populations threatened with extinction for the past four decades. Current summary statistics in the (IUCN) Red List of Threatened Species show growing numbers of threatened and endangered species in the best-studied groups. Biodiversity loss is a global change of particular urgency as lost species and ecosystems cannot be recovered. Under this overarching priority, the following criteria help establish which potential partnerships are appropriate for NASA support.

## **II. Goals and Objectives**

### **Goals**

The goal of the Ecological Forecasting Program Element is:

***To extend NASA Earth science results to our partners' operational ecological forecasting systems in order to conserve biodiversity and foster sustainable development at home and abroad***

## Objectives

All National Applications Program Elements are aligned to the NASA Strategic Plan and the agency's objectives as expressed in the NASA Integrated Budget and Performance Document (IBPD) and the Performance Assessment Rating Tool (PART).

Ecological Forecasting addresses the first elements of the NASA vision statement: *to improve life here* and the agency's mission: *to understand and protect our home planet*. It directly addresses the overarching goal of the Applied Sciences Program: *to bridge the gap between Earth system science research results and the adoption of data and prediction capabilities for reliable and sustained use in decision support*. The Ecological Forecasting Program Element draws upon the Science Mission Directorate's Research and Analysis Program for its Earth observation data. The models, which are the sine qua non of ecological forecasting, arise from the Research and Analysis Program, the efforts of our partners, and other research activities. The Applied Sciences Program supports the integration of observation data and models into decision support tools. The Ecological Forecasting Program Element works with NASA's partners to enable DSS that will prove useful to decision makers, resource managers, and members of the general public concerned with the impacts of natural and human-induced environmental changes on living systems. Specific areas of focus for DSS are: regional scale conservation and development efforts (e.g.: the Mesoamerican Biological Corridor), the management of protected areas in the U.S. and abroad, and the management of marine fisheries.

## III. Program Management and Partners

### A. Program Management

#### Management Assignments

Program Manager  
Mr. Woody Turner  
Earth-Sun System Division  
Science Mission Directorate  
NASA Headquarters  
Washington, DC 20546-0001

#### Responsibilities:

- Program development, including program plans and budgets
- Development and implementation of interagency agreements and partnerships with other organizations
- Development and implementation of solicitations for Ecological Forecasting Program tasks
- Primary responsibility for metrics, performance goals and other performance evaluation criteria
  
- Liaison for relevant U.S. Government interagency initiatives, e.g.: the U.S. Climate Change Science Program (CCSP), the Group on Earth Observations (GEO)—particularly its societal benefit areas of ecosystems and biodiversity, the Congo Basin Forest Partnership (CBFP), the President's Initiative Against Illegal Logging, etc.

Project Manager for SERVIR

Mr. Daniel Irwin

NASA National Space Science and Technology Center (NSSTC)

320 Sparkman Drive

Huntsville, AL 35805

Responsibilities:

- Coordination of activities of project partners
- Development of metrics for project success
- Meeting project milestones
- Management of development node at NASA NSSTC
- Coordination with primary project facility in Panama
- Presentations on project to audiences around the world

Project Manager for PAM

Dr. Gary Geller

M/S: 171-264

Jet Propulsion Laboratory

4800 Oak Grove Drive

Pasadena, CA 91109-8099

Responsibilities:

- Exploring and evaluating the remote sensing needs of protected area managers and other conservation practitioners in potential partner organizations
- Identifying solutions that leverage remote sensing to address the needs of protected area managers and other conservation practitioners
- Establishment of project goals, milestones, and other measures of success
- Coordination of various activities under this project

Project Manager for MFF

To be determined

Responsibilities:

- Exploring and evaluating the remote sensing needs of marine fisheries managers and other organizations monitoring fisheries
- Identifying solutions leveraging remote sensing to address these needs
- Establishment of project goals, milestones, and other measures of success

## **B. Ecological Forecasting Network & Partners**

Ecological Forecasting relates to several other NASA Applied Sciences Program Elements. In particular, it can draw upon knowledge gained and techniques and DSS developed by the Coastal Management, Invasive Species, Public Health, Water Quality, and Carbon Management Program Elements. These and other program elements should, in turn, derive benefits from the models and decision support tools of Ecological Forecasting. One example of such partnership in action was the Ecological Modeling for NASA Applied Sciences Workshop held in early 2005. It brought together funded participants in the Ecological Forecasting, Invasive Species, and Public Health Program Elements to explore common approaches to ecological modeling. The workshop focused on three broad modeling approaches: (1) geostatistical niche models that provide forecasts of species distributions through correlations among a number of environmental variables and species location information; (2) process-based models that focus on an organism's energy balance in an effort to model its potential distribution from its energy requirements; and (3) assimilation models that bring together satellite and *in situ* data in process-based models of biogeochemical cycles to forecast how landscapes change over time. Modeling species distributions from Earth observation data is a fundamental component of the Ecological Forecasting, Invasive Species, and Public Health Program Elements.

Key partners and relevant DSS identified under the Ecological Forecasting program element include (relevant DSS in parentheses):

### Earth-Sun System Division and NASA Centers:

- 1) Marshall Space Flight Center-MSFC (SERVIR)
- 2) Ames Research Center-ARC (PAM via Terrestrial Observation and Prediction System)
- 3) Jet Propulsion Laboratory-JPL (PAM)
- 4) Goddard Space Flight Center-GSFC (PAM)

### Federal Partners:

- 1) USAID (SERVIR)
- 2) U.S. Department of Agriculture/U.S. Forest Service (PAM)
- 3) U.S. Department of State (PAM)
- 4) U.S. Department of the Interior/U.S. Fish & Wildlife Service, National Park Service, U.S. Geological Survey (PAM)
- 5) U.S. Department of Commerce/National Oceanic and Atmospheric Administration (PAM/MFF)
- 6) U.S. Department of Energy/Oak Ridge National Laboratory (SERVIR)
- 7) CCSP (SERVIR, PAM, MFF)
- 8) GEO (SERVIR, PAM, MFF)

### Universities:

- 1) University of Maryland (PAM)



- 2) Michigan State University (PAM)
- 3) California State University Monterey Bay (PAM)
- 4) University of Alabama, Huntsville (SERVIR)
- 5) University of Arkansas (SERVIR)
- 6) Cornell University (MFF/PAM)

International, National and Regional Organizations:

- 1) CCAD (SERVIR)
- 2) CATHALAC (SERVIR)
- 3) The World Bank (SERVIR)
- 4) NatureServe (PAM)
- 5) Conservation International (PAM)
- 6) World Wildlife Fund (PAM)
- 7) Wildlife Conservation Society (PAM)
- 8) The Wilderness Society (PAM)
- 9) American Museum of Natural History (PAM)
- 10) Smithsonian Institution's Conservation and Research Center (PAM)
- 11) Conservation Biology Institute (PAM)
- 12) The Nature Conservancy (PAM)
- 13) United Nations Environment Programme (PAM)
- 14) GEOSS (SERVIR, PAM, MFF)
- 15) Woods Hole Research Center (PAM)
- 16) Yellowstone Ecological Research Center (PAM)

Distributed Active Archive Centers (DAAC) and Earth Science Modeling Centers:

None.

## **IV. Decision Support Tools and Management Issues**

### **Priority Decision Support Tools**

#### **Regional Visualization and Monitoring System for Mesoamerica (SERVIR)**

Since 1999, NASA has worked with Central American partners to support their development of the Mesoamerican Biological Corridor (MBC) and other activities focused on regional sustainable development. Located at the junction of North and South America and characterized by significant changes in elevation, Central America is a biological crossroads with seven to eight percent of the planet's biodiversity in less than one half of one percent of its land mass. In addition, off its shores lies the second largest system of coral reefs on the planet. In 1997, the leaders of the seven nations of Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) announced an unprecedented multinational effort to integrate their conservation efforts across international boundaries and promote sustainable development throughout the region. The resulting MBC is a series of national parks, other protected areas, and lands subject to special management regimes extending from southern Mexico to the Colombian border. NASA has partnered with the U.S. Agency for International Development (USAID), the World Bank, the Central American Commission for Environment and Development (CCAD), the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC), and others to promote the development of a Regional Visualization and Monitoring System known as SERVIR. SERVIR is a web-based entity operating through a series of nodes. The primary node is at the CATHALAC facility in the City of Knowledge, Panama with other nodes located in each of the Central American countries. In addition, a development node exists at the NASA Marshall Space Flight Center in Huntsville, AL. Through these nodes, Central American managers and the general public use satellite imagery to detect wild fires and changes in land cover, track rainfall and weather patterns, and monitor coastal margins for red tide events. The incorporation of climate models helps users understand the poorly known connection between changes in land cover and climate variation while the integration of new numerical meteorological models improves weather forecasts. SERVIR's MesoStor system allows users to select and download satellite imagery and other datasets; while SERVIR's online maps enable the user to combine, view, and query satellite imagery from the TRMM, Terra, Aqua, Landsat, and other satellites together with other environmental and socioeconomic data. SERVIR also generates decision support products in the following areas: fires, red tides, climate change, land cover/land use change, short-term numerical weather forecasts, floods, a food security early warning system, hurricanes, earthquakes, GOES fire and rain products, and volcanoes. In addition, it offers software tools such as World Wind and Skyline Central America 3-D that produce visualization products for decision makers and the public. NASA is funding SERVIR through a five-year award under the Research, Education and Applications Solutions Network (REASoN) Cooperative Agreement Notice (CAN).

### **Protected Area Management (PAM)**

PAM is an umbrella designation covering several DSS under development by NASA's institutional partners (please see Section V.A for details on the DSS). A shared focus on providing decision support tools for managers of national parks, wildlife refuges, and other protected areas links these DSS. World population is expected to increase 50 percent by 2050, resulting in escalating demands for ecosystem services by approximately 9 billion people. Protected areas will be increasingly important for the conservation of biodiversity. They are also vital for the maintenance of other ecosystem services, such as fully functioning watersheds. In addition, protected areas provide direct economic benefits to surrounding communities. The U. S. National Park Service (NPS) estimates that expenditures and job creation in and around U.S. protected areas have economic impacts equivalent to \$10.6 billion per year (estimate derived for 2001 from National Park Service Money Generation Model 2). For PAM, relevant U.S. operational agencies include the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), and their research arm within the U.S. Geological Survey (USGS) as well as the U.S. National Oceanic and Atmospheric Administration (NOAA), which oversees the nation's marine protected areas. In addition to a focus on U.S. Federal agencies, PAM also works domestically and internationally through the efforts of conservation nongovernmental organizations (NGOs), research institutions, and USAID. A primary challenge for the Ecological Forecasting Program Element is to integrate, as appropriate, DSS being supported by PAM into SERVIR.

### **Marine Fisheries Forecasting (MFF)**

NOAA is exploring the integration of remote sensing data into marine fisheries models and NASA is funding research efforts along these lines. A decision support tool for forecasting marine fisheries must link physical oceanography and climate data with ecosystem models to understand the effects of climate oscillations on certain coastal and pelagic fisheries. Many fisheries around the world appear to be in decline. Fisheries managers can use knowledge of the drivers of marine productivity, gained from remote sensing, to improve sustainable fisheries management. MFF leverages progress being made in several research projects funded under the Interdisciplinary Science in the NASA Earth Science Enterprise solicitation. Relevant research projects focus on modeling the impacts of climate events (e.g., El Nino), climate change, and other ecological disturbances on ecosystems and species distributions. This work is being conducted as a partnership between the Ecological Forecasting and Coastal Management Program Elements. As is the case with PAM, an important challenge is to integrate appropriate DSS supported under MFF into SERVIR.

## Potential Ecological Forecasting Management Issues: FY06-FY10

### Supporting Efforts

1. 2 FTEs for SERVIR to support remote sensing analysis/web-based GIS and the management of the project at MSFC  
Budget: \$273,000 for FY06  
Lead Center: MSFC      PI is Tom Sever  
Deliverable: Ability to address additional, unforecasted work resulting from popularity of SERVIR and additional demands on investigators' time, also includes additional requests from HQ
2. Project Manager for PAM  
Budget: \$280,000 for FY06  
Lead Center: JPL      PI is Gary Geller  
Deliverable: 0.85% of his time (plus travel) for overall coordination and management of this element of the program
3. Additional reporting for PAM and SERVIR  
Budget: \$35,000 for FY06 (rising in out years)  
Lead Center: GSFC      PI is Tom Hood  
Deliverable: Assistance with PAM and SERVIR Project Plans and evaluation, verification, validation, and benchmark (EVVB) reporting
4. Project Manager for MFF  
Budget: \$150,000 in FY06 (rising in the out years)  
Lead Center: TBD      PI is TBD  
Deliverable: Manager for the project
5. Workshops and symposia  
Budget: \$65,000 in FY06 and TBD in FY06-09  
Lead Center: HQ      PIs are TBD  
Other Partners: FWS, USGS, NOAA, ARC, TBD  
Deliverable: FWS/USGS Partnership Workshop, Ecological Modeling Workshop, MFF Workshop, Yellowstone Intercomparison Workshop, and outreach at major U.S. ecological meetings
6. Heinz Center *State of the Nation's Ecosystem Report*  
Budget: \$100,000 over next 2 years, then TBD  
Lead Center: HQ      PI is Robin O'Malley  
Other Partners: Research Program  
Deliverable: Commitment to OSTP
7. Support for web site and publication  
Budget: \$24,000 for FY06, then TBD  
Lead Center: HQ      PI is TBD  
Deliverable: Improved web site and color figures for publication

## **Cross-Application Activities**

The program consists of functional elements that contribute to all of the National Applications activities. The intention is to have the performance of these functions leverage accomplishments, and therefore the apparent resource investment, to the greatest extent possible into the National Applications partnerships. These functions are: Geoscience Standards and Interoperability, Human Capital Development, Integrated Benchmark Systems, and Solutions Networks. Examples of leveraged activities are:

- The Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.
- A Solutions Networks capability to discover candidate configurations of NASA research results with the potential to improve partner's decision support systems.
- A Rapid Prototyping Capability to support NASA and partners in reducing uncertainty and testing the validity of NASA research results in decision support tools.
- Systems integration capability, knowledge tools and skilled human capital to help conduct studies on the systematic transitioning of the results of research to operational uses and the capability of operational systems to support scientific research.
- A student-based, human capital development program for building capability in entry level participants in the community of practice while developing solutions for state and local applications.

## **V. Application Activities**

### **A. Projects**

All National Applications Program Elements authorize peer-reviewed projects to support each element's goal and objectives. To secure funding and authorization to undertake activities supporting NASA and the Applied Sciences Program, project teams are responsible for developing project plans and managing the activities. The project plans specify the Earth-Sun observations, models, and other research results to extend to decision support tools as well as the activities to produce appropriate deliverables. The plans integrate contributions from appropriate the partners, NASA Centers and other contributors from the community of practice. Projects are expected to extend the benefits of NASA research results to the maximum extent possible, including the use observations from sensors on: Aura, Terra, Aqua, TRMM, NPP, NPOESS, Hydros, Topex, Jason, OCO and Aquarius.

### **B. Solicitations**

The Applied Sciences Program utilizes full and open competitions to fund proposals from the community to contribute the Agency's objectives. This implementation strategy will continue to be critical part of extending the benefits of NASA Earth-Sun system research results and contributing to the improvement of future operational systems. The Program has participated in providing opportunities to the community in recent solicitations, including REASoN, Decisions 2004, and Decisions under ROSES. The proposals related to this National Applications Program Element that have been funded under these solicitations are described in Section V.D. Program Element Projects.

### **C. Congressionally Directed Activities**

As of the publication of this document, an assignment of FY06 congressionally mandated activities was not completed by the Agency.

The procurement rules and management practices of the Agency require that congressionally mandated activities follow the same principles of planning and accountability as all other funded projects. Only activities that are aligned with NASA's mission, are technically credible, and are appropriately budgeted will be approved to receive funding from the Program. The project teams of congressionally mandated activities are responsible for developing project plans and managing the activities.

### **D. Program Element Projects**

Included below are the brief descriptions of the funded projects managed under this National Applications Program Element. Complete and detailed descriptions are documented in the Project Plans for each activity.

Project: SERVIR				Directed Project	
SERVIR (known as the Regional Visualization and Monitoring System) will operate a series of nodes located in the U.S. and each of the Central American countries. Through it, Central American managers can use observational spacecraft imagery to detect wild fires and major changes in land cover, track rainfall and weather patterns, and monitor coastal margins and coral reefs throughout the region. Models can help users understand the poorly known connection between changes in land cover and climate variation. SERVIR combines observational spacecraft imagery from the NASA TRMM, Terra, Aqua, OrbView-2, and Landsat spacecrafts with environmental and socioeconomic data by means of a geographic information system. It also generates visualization products for decision makers and the public. NASA is funding SERVIR through an award under the Research, Education and Applications Solutions Network (REASoN) Cooperative Agreement Notice (CAN).				<i>Budget (\$K)</i>	
				<i>Procurement</i>	
				FY06	873
<i>Project Manager</i>	<i>Centers</i>	<i>Timeframe</i>	<i>Partners</i>	FY07	649
Dan Irwin	MSFC	FY03 - FY07	U. Alabama, Huntsville & URF	FY08	0
				FY09	0
				FY10	0
<i>Earth Science Products</i>	MesoStor, WMS on-line maps, Decision Support Tools (e.g. fires, red tides, climate change, numerical weather forecasts), 3D visualizations. Landsat, MODIS, TRMM, GOES, POES. Aster			<i>Other Apps.</i>	
<i>Deliverables</i>	<i>Description</i>	<i>End Date</i>	<i>IBPD Metric #</i>	Disaster Management, Water Management, Carbon Management	
	Evaluation Report	N/A			
	Design & Implement	8/31/2005			
	Verification and Validation Report	1/20/2006			
	Benchmark Report	1/20/2006	5ESA6.F,10.B		
	Project Plan	10/1/2005			
<i>Notes:</i> Deliverables: Design & Implement due dates are for Fires, Red Tide, and Climate.					



Project: NatureServe Decision Support Tool for Western Land Managers					Solicitation	
PAM is an umbrella designation covering several DSS under development by NASA's institutional partners. A shared focus on providing decision support tools for managers of national parks and other protected areas links these DSS. World population is expected to increase 50 percent by 2050, resulting in escalating demands for ecosystem services by approximately 9 billion people. Protected areas are increasingly important for the conservation of biodiversity. They are also vital for the maintenance of other ecosystem services, such as fully functioning watersheds. In addition, protected areas provide direct economic benefits to surrounding communities. The U. S. National Park Service (NPS) estimates that expenditures and job creation in and around U.S. protected areas have economic impacts equivalent to \$10.6 billion per year (estimate derived for 2001 from National Park Service Money Generation Model 2).				Budget (\$K)		
				Procurement		
				FY06	250	
Project Manager	Centers	Timeframe	Partners	FY07	0	
Gary Geller	JPL	FY03 - FY06	NatureServe	FY08	0	
				FY09	0	
				FY10	0	
Earth Science Products	Version 2.0 Vista DST, Landsat, SRTM, AVHRR			Other Apps.		
Deliverables	Description	End Date	IBPD Metric #	Carbon Management, Water Management		
	Evaluation Report	6/30/2005				
	Design & Implement	9/30/2005				
	Verification and Validation Report	9/30/2006				
	Benchmark Report	9/30/2006				
	DST for Greater Yellowstone Area	6/30/2007				
	Project Plan	10/1/2005				
Notes:						

Project: Enhancement of TOPS					Solicitation	
The overall goal of this project is to develop a flexible ecological nowcasting and forecasting system that combines multiple distributed data sources and models to provide near-real-time answers to questions about the state of the Earth system. By providing a framework for ecological forecasting as well as the post-processing of model outputs needed to visualize the results, TOPS will facilitate rapid data exploration and what-if analysis. This capability will be essential to fully achieve the promise of a Sensor Web, in which multi-terabyte volumes of real-time data are used to support activities ranging from basic science to monitoring and tracking severe weather, natural disasters, and other critical events.				Budget (\$K)		
				Procurement		
				FY06	500	
Project Manager	Centers	Timeframe	Partners	FY07	500	
Gary Geller	JPL, ARC	FY03 - FY07	National Park Service	FY08	0	
				FY09	0	
				FY10	0	
Earth Science Products	TOPS 30-day data products broken into MODIS (8 day and annual products), Meteorology (Daily), TOPS Ecosystem, and TOPS-BGC Forecasts (5 to 180 day advance forecasts).			Other Apps.		
Deliverables	Description	End Date	IBPD Metric #	Carbon Management, Water Management, Invasive Species		
	Evaluation Report	1/15/2006				
	Design & Implement	12/31/2006				
	Verification and Validation Report	9/30/2007				
	Benchmark Report	9/30/2007				
	Project Plan	10/1/2005				
Notes:						

Project: Global Fire Information for Resource Management: Transitioning from a Research to an Operation System with an Emphasis on Protected Areas					Solicitation	
The University of Maryland’s Fire Information for Resource Management System (FIRMS) seeks to develop fire alerts for protected area managers around the world. The system will be served through the Food and Agriculture Organization (FAO) of the United Nations Environment Programme and Conservation International.				Budget (\$K)		
				Procurement		
				FY06	359	
Project Manager	Centers	Timeframe	Partners	FY07	370	
Gary Geller	JPL	FY05 - FY07	UMD, UN FAO, UN EP, Conservation Int’l	FY08	0	
				FY09	0	
				FY10	0	
Earth Science Products	MODIS Rapidfire products			Other Apps.		
Deliverables	<u>Description</u>			<u>End Date</u>	<u>IBPD Metric #</u>	Disaster Management, Carbon Management
	Evaluation Report					
	Design & Implement					
	Verification and Validation Report			1/30/2007		
	Benchmark Report			1/30/2007		
	Annual report w/V&V, Benchmark			1/30/2007		
	Annual report w/V&V, Benchmark			1/30/2008		
Notes:						

Project: Integrating Earth Science Enterprise Results into Protected Areas Decision Support for the Albertine Rift					Solicitation	
Under the Albertine Rift protected area management project, the Woods Hole Research Center, in collaboration with partners at the Wildlife Conservation Society, USAID, and managers in the Uganda and Democratic Republic of Congo park organizations will extend the benefits of observations and associated models for park management.				Budget (\$K)		
				Procurement		
				FY06	281	
Project Manager	Centers	Timeframe	Partners	FY07	301	
Gary Geller	JPL	FY05 - FY07	WHRC, USAID, Wildlife Society of Uganda etc.	FY08	0	
				FY09	0	
				FY10	0	
Earth Science Products	ASTER, Landsat, MODIS, National information systems for protected area management.			Other Apps.		
Deliverables	<u>Description</u>			<u>End Date</u>	<u>IBPD Metric #</u>	Carbon Management, Disaster Management
	Evaluation Report					
	Design & Implement					
	Verification and Validation Report			2/28/2007		
	Benchmark Report			2/28/2007		
	Annual report w/V&V, Benchmark			2/28/2007		
	Annual report w/V&V, Benchmark			2/28/2008		
Notes:						

## **E. Additional Activities & Linkages**

In general, the NASA Ecological Forecasting Program Element is following program direction to emphasize the link to the following activities:

- *Federal Enterprise Architecture (FEA)* is a business and performance-based framework to support cross-agency collaboration, transformation, and government-wide improvement.
- *The Global Information Grid (GIG)* is the first stage of a U.S. military global, high-bandwidth, Internet protocol-based communications network (a.k.a., “the Internet in space”).
- *The Joint Center for Satellite Data Assimilation (JCSDA)* is a multi-agency collaboration to accelerate and improve the quantitative use of research and operational satellite data in weather and climate prediction models. NOAA, NASA, Navy, Air Force, and National Science Foundation (through University Corporation for Atmospheric Research (UCAR)) collaborate in JCSDA.
- *Metis* is a visual modeling software tool for planning, developing, and analyzing agencies' enterprise architectures. The Applied Sciences Program is using Metis to identify possible linkages between observations, models, and decision support tools to support the GEOSS and NASA/NOAA R2O activities.
- *Observing System Simulation Experiments (OSSEs)* use simulated observations to assess the impacts of future satellite instruments on weather and climate prediction and provide opportunities to test new designs and methodologies for data gathering and assimilation.
- *Project Columbia* is a NASA-wide project to develop a new, fast supercomputer (using an integrated cluster of interconnected processor systems) to support the Agency's mission and science goals, including enhanced predictions of weather, climate, and natural hazards.

## **E. IBS Request**

- Rapid Prototyping Center a proposed center at Stennis to support NASA and partners in testing and verification of Earth-Sun science results in decision support tools
- Transition from Research to Operations Network (R2O) is a network that focuses on systematically transitioning the results of research to operational uses.

### **Program Response to IBS Request**

To be supplied by program management.

## **E. Crosscutting Request**

- DEVELOP is a student-based program for rapidly prototyping solutions for state and local applications and helping students develop capabilities related to applied Earth-Sun science.
- The Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.

### **Program Response to Crosscutting Request**

To be supplied by program management.

## VI. Budget: FY06-010

The following table lists the Ecological Forecasting Program budget (procurement) for FY2006:

<u>Project</u>	<b>FY06 Procurement Allocation (\$K)</b>
SERVIR	\$ 873
NatureServe Decision Support Tool for Western Land Managers	\$ 250
Enhancement of TOPS	\$ 500
Global Fire Information for Resource Management: Transitioning from a Research to an Operation System with an Emphasis on Protected Areas	\$ 359
Integrating Earth Science Enterprise Results into Protected Areas Decision Support for the Albertine Rift	\$ 281
<b>Total = \$ 2263</b>	

Appendix C lists program-wide budget allocations for FY2006-10.

## **VII. Program Management and Performance Measures**

The Ecological Forecasting management team uses performance measures to track progress, identify issues, evaluate projects, make adjustments, and establish results of the program element. The program's Goals and Objectives state broadly what the program intends to achieve. These measures help monitor progress within and across specific activities to ensure the program meets its goals and objectives. The management team analyzes these measures retrospectively in order to make adjustments proscriptively to the program approach and objectives.

The measures are in two categories. Program Management Measures are internally focused to assess the activities within the program. Performance and Results Measures are externally focused to assess if the program activities are serving their intended purposes. In general, the Program Manager uses these measures to evaluate the performance of activities conducted and sponsored by the program, especially the projects. The Applied Sciences Program uses this information in preparing Integrated Budget & Performance Document (IBPD) directions and Program Assessment Rating Tool (PART) responses.

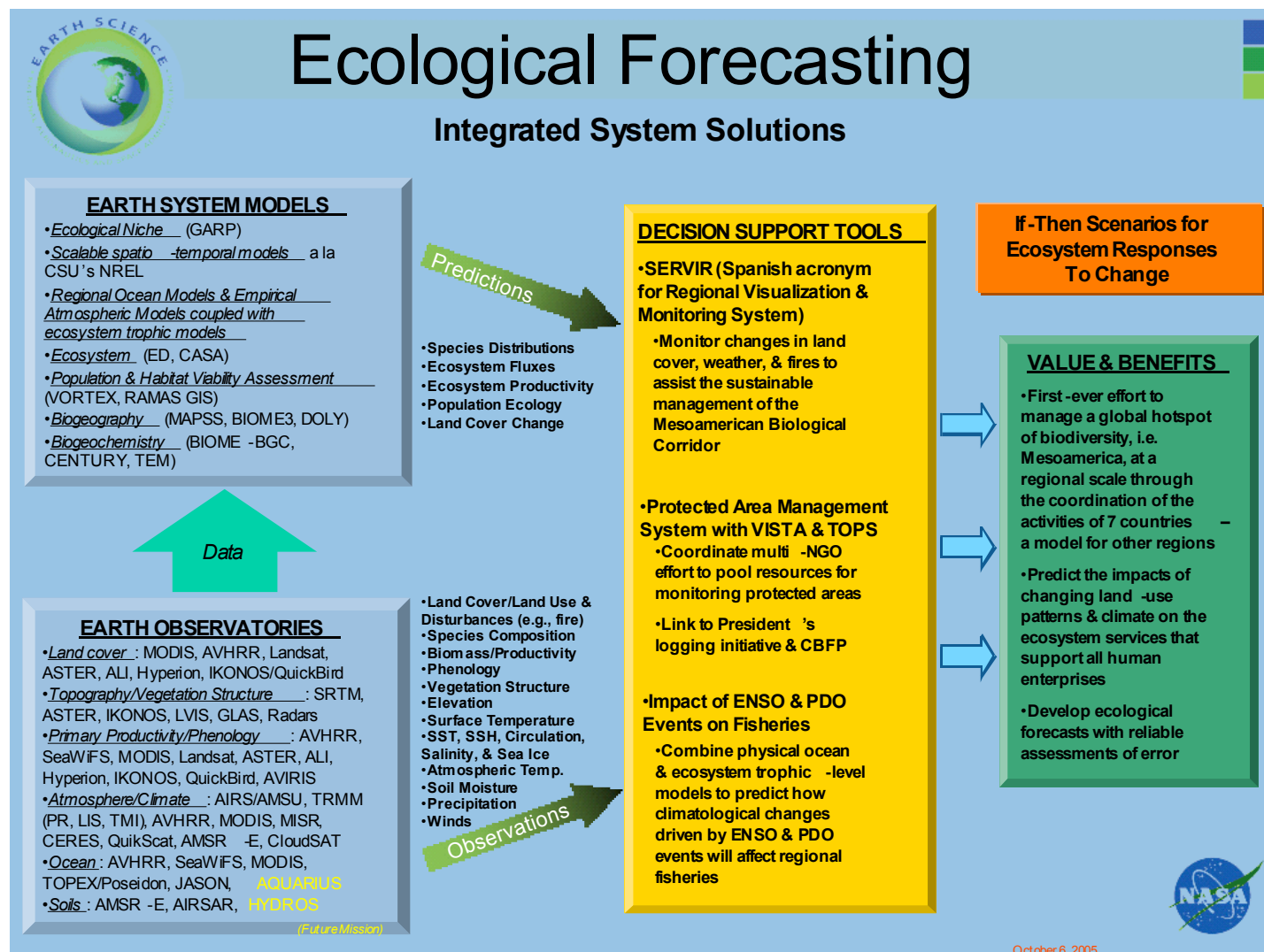
In addition to the stated measures, the Program Manager periodically requests an assessment of Ecological Forecasting's plans, goals, priorities, and activities through external review. The Ecological Forecasting team uses these measures along with comparisons to programmatic benchmarks to support assessments of the Applied Sciences Program (e.g. internal NASA reviews and OMB PART). Specifically, the Program Manager uses comparisons to similar activities in the following programs (i.e., program benchmarks) to evaluate its progress and achievements:

- Environmental and Societal Impacts Group at the National Center for Atmospheric Research
- Global Monitoring for Environment and Security (GMES)

## VIII. Appendices

### A. Integrated System Solutions Diagram

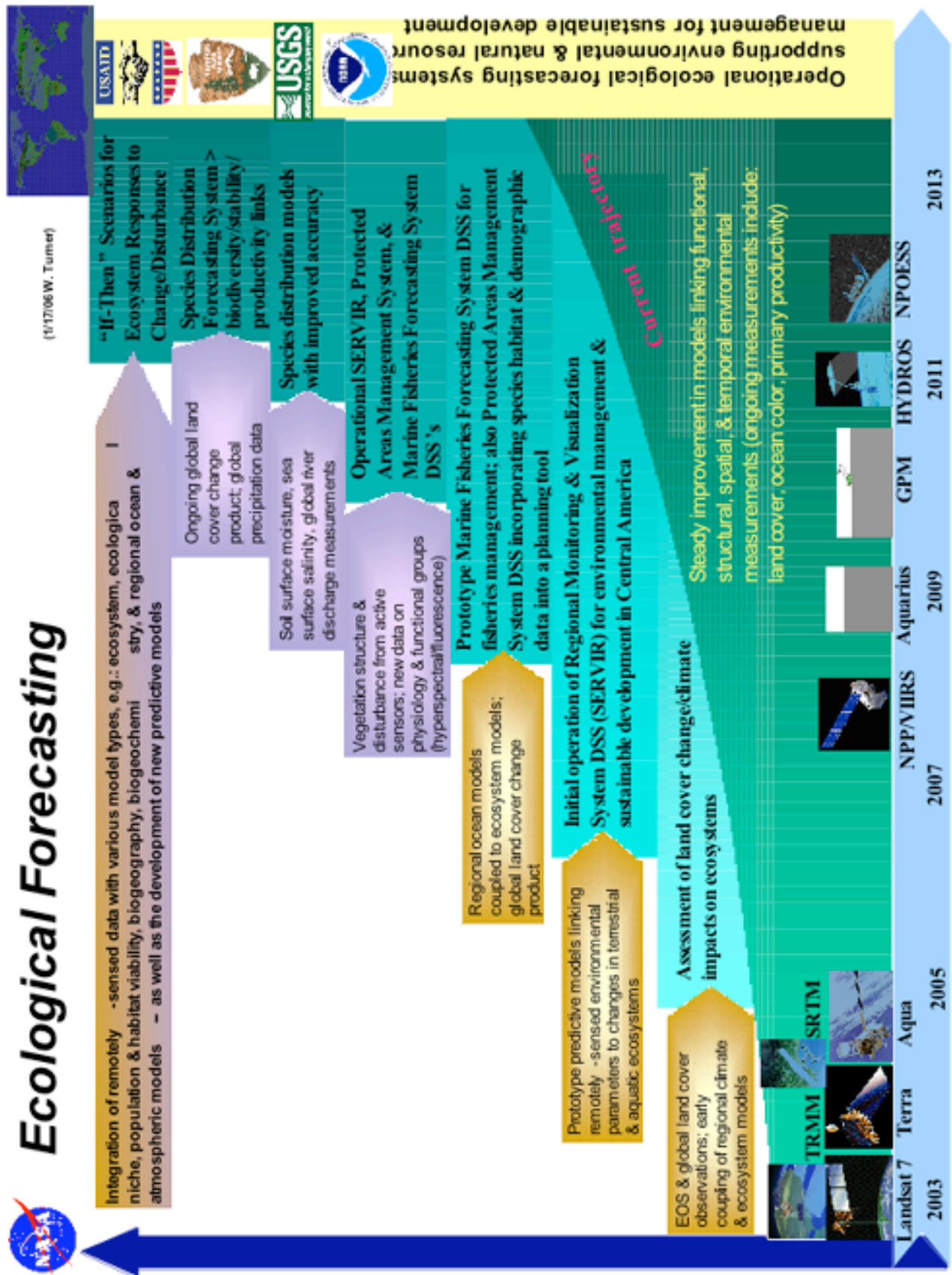
The figure below illustrates how Science measurements, model products, and data fusion techniques support the Ecological Forecasting Program's partners and their decision support tools and shows the value and benefits of Science to society.





## **B. Roadmap**

This roadmap for the Ecological Forecasting Program Element brings together relevant space missions, resulting data sets, and the models required to generate outputs for decision support. It shows the steps along the path to reaching a major target for this Program Element - operational Ecological Forecasting systems supporting environmental and natural resource management for sustainable development. In doing so, it builds directly upon the roadmaps for the other Science Focus Areas. Of these, the Carbon Cycle and Ecosystems Focus Area roadmap is especially relevant as some of the technological advances called for here originate on that roadmap.



**C. Applied Sciences Program Budgets FY2006-10**

The following figures represent the FY06 budgets for the respective Program Elements; they do not represent the entire Applied Sciences Program budget. There is an additional \$8.95million in Congressionally-directed activities and \$5million for the Mississippi Research Consortium that these figures do not incorporate.

<b>Program Element</b>	<b>FY06 Procurement Allocation</b>
<b>National Applications</b>	
Agricultural Efficiency	\$ 1,955,803
Air Quality	\$ 3,116,464
Aviation	\$ 3,048,878
Carbon Management	\$ 1,544,831
Coastal Management	\$ 1,416,233
Disaster Management	\$ 2,743,760
Ecological Forecasting	\$ 3,240,170
Energy Management	\$ 1,875,253
Homeland Security	\$ 1,987,054
Invasive Species	\$ 2,241,940
Public Health	\$ 3,356,124
Water Management	\$ 1,714,341
<b>Crosscutting Solutions</b>	
DEVELOP	\$ 1,498,000
Geospatial Interoperability	\$ 2,400,000
Solutions Networks	\$ 2,822,000
Integrated Benchmarking System	\$ 4,500,000

The following figures show the five-year run-out for the entire Applied Sciences Program. The figures are based on the FY07 President's budget submitted to Congress. The lower line shows the target budget including agency corporate and institutional adjustments.

	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>Present Budget Summited to Congress</b>	53,254,855	51,049,000	50,287,000	48,588,000	48,662,000
<b>Target After Adjustments</b>	47,321,663	39,101,000	33,922,000	34,801,000	34,803,000

## D. Related NASA and Partner Solicitations and Grants

Appendix D lists NASA Earth-Sun system science research projects, Earth science fellowships, GLOBE activities, and Earth science New Investigators related to Ecological Forecasting activities.

### *Fellowships*

<b>Earth Science Fellowships</b>			
<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of New Hampshire	Jeanne Anderson	The Integration of AVIRIS and LIDAR Data for Remote Detection of Forest Structure, Species Composition, and Land-Use Legacies in the White Mountains of New Hampshire	2004-2006

### *Fellowships*

<b>Earth Science Fellowships</b>			
<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Stony Brook University	Isabel Ashton	Biological invasions and alterations of the global carbon balance	2004-2006

### *Fellowships*

<b>Earth Science Fellowships</b>			
<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Michigan Ann Arbor	Amy Burnicki	Spatial and Temporal Patterns of Error in Land Cover Change Analyses: Identifying and Propagating Uncertainty for Ecological Monitoring and Modeling	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Oregon State University	Daniel Hayes	Mapping Regional Carbon Stocks and Monitoring Carbon Emissions from Land Cover and Land Use Change Along the Mesoamerican Biological Corridor	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Texas A&M	Emily Hollister	Land Use and Land Cover Changes in Temperate Savannas: Impact of Woody Plant Encroachment and Prescribed Fire on Ecosystem Carbon Storage	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Michigan State University	Edward Laurent	Using the Precision of Landsat Imagery to Extrapolate Pattern-Process Relationships of Wildlife Across Landscapes: GRAIN and HABICLASS	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Arizona	Kathryn Mauz	Characterizing Phenological Transitions in the Neotropical Deciduous Forest, West Mexico: Integrated Analysis of Satellite Remote Sensing, Ecophysiological, and Climate Time Series	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Florida	Kai-Jen Tien	Linking Changes in Dynamic Vegetation to Passive Microwave Remote Sensing	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Florida	Tracy Van Holt	Twenty Years of Land-cover and Land-use Change Effects on Nearshore Marine Resources in Southern Chile	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Boston University	Weile Wang	Tracing Causality and Feedback Relations between Land Surface Temperatures and Vegetation Activity in Twenty-Years of Remote Sensing Data	2004-2006

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
UC Santa Barbara	Clarissa Anderson	A Model for Remotely Detecting the Dynamics and Toxicity of Pseudo-Nitzschia Blooms in the Santa Barbara Channel	2005-2007

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
UNC Chapel Hill	Joel Gramling	The Evaluation of Productivity-Diversity Relationships Across Two Distinct Ecological Communities with Respect to Global Climate Change Using Local and Landscape Scale Data	2005-2007

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Maryland College Park	Christina Kennedy	Impacts of Land Cover and Land Use Change on Bird Communities of the Mayan Forests of the Southern Yucatan Peninsula	2005-2007

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Maryland College Park	Tatiana Loboda	Impacts of Climate and Land Use Change on the Frequency of Catastrophic Fires and the Siberian Tiger	2005-2007

***Fellowships***

**Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Michigan State University	Anita Morzillo	Application of Remotely-Sensed Imagery to Meet the Needs of Wandering Wildlife and Human Activity	2005-2007

### ***Fellowships***

#### **Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Maryland	Kevin Murphy	A Multi-Sensor Approach To Identifying Trends of Anthropogenic and Natural Change in Orangutan Habitat	2005-2007

### ***Fellowships***

#### **Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Texas	Amy Neuenschwander	Austin Characterization of the Interaction Between Water and Vegetation in the Okavango Delta, Botswana	2005-2007

### ***Fellowships***

#### **Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
UC Santa Barbara	Alton Williams	From Cellulose to Selling Out: Tree Ring Isotopes Can Identify the Culprits Behind Meso-Climatic Change in a Tropical Cloud Forest	2005-2007

### ***Interdisciplinary Studies***

#### **EOS Interdisciplinary Science**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of New Hampshire	Udaysankar Nair	Near Global Biogeography of Tropical Montane Cloud Forests	2004-2006



*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Duke University	Richard Barber	Impact of Pacific Climate Variability on Ocean Circulation, Marine Ecosystems and Living Resources: A Multi-Scale Modeling and Data Assimilation Approach to Forecasting	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Ocean Imaging	Larry Deysher	Monitoring of Global Change in Temperate Reef Communities Using Satellite Remote Sensing Technologies	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Maryland	Ralph Dubayah	Characterizing Forest Structure for Assessments of Carbon Cycling and Biodiversity: An Integrated Approach Using Lidar Remote Sensing, Field Studies, and Ecosystem Modeling	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Virginia	Herman Shugart	Hydrologic and Nutrient Controls on the Structure and Function of Southern African Savannas: a Multiscale Approach	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
NASA/GSFC	James Smith	The Distribution and Abundance of Bird Species-- Towards a Satellite, Data Driven Avian Energetics and Species Richness Model	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of South Carolina	Brian Helmuth	Climate Change and Intertidal Biogeography: Coupling Remote Sensing Data to Thermal Physiology Across a Cascade of Scales	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Roffer's Ocean Fishing Forecast Service	Mitchell Roffer	Study of Ocean Environmental Parameters to Forecast the Effects of Climate Variability on Pelagic Fish Resources	2004-2006

*Interdisciplinary Studies*

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
UCLA	Thomas Smith	Quantifying Patterns of Biodiversity in a Changing Climate: Integrating Biological Point and Process Data with Remotely Sensed Environmental Variables	2004-2006

**Interdisciplinary Studies**

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
USGS	Thomas Stohlgren	Fingerprinting Native and Non-Native Biodiversity in the United States, Phase 1: The Western U.S.	2004-2006

**Interdisciplinary Studies**

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
North Carolina State University	John Morrison	Connectivity and Upwelling Dynamics In the Galapagos Marine Reserve (GMR)	2004-2006

**Interdisciplinary Studies**

**EOS Information Service**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of South Florida	Serge Andrefouet	Environmental Assessments of Coral Reef Ecosystems: Interdisciplinary Research Using EOS Platforms and Numerical Models	2004-2006

**Interdisciplinary Studies**

**EOS Interdisciplinary Science**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
JPL	Marc Simand	Large scale assessment of landscape changes and recovery in forest structure of mangrove wetlands subject to human, freshwater diversion, and natural disturbances (hurricanes, other severe storms, sea level change) using enhanced SRTM data	2004-2006

***New Investigators***

**New Investigators Program**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
NASA/GSFC	Eric Brown de Colstoun	Consequences of Land Cover/Use Changes on National Parks	2004-2006

***New Investigators***

**New Investigators Program**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Georgia	Jason Drake	Multidimensional Characterization of Southern Pine Forest Structure and Integrity	2004-2006

***New Investigators***

**New Investigators Program**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
SUNY Stony Brook	Catherine Graham	Remote Sensing and Biodiversity in a Changing Climate	2004-2006

***New Investigators***

**New Investigators Program**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Hawaii	Eric Hochberg	Empirical Radiative Transfer Corrections for Deterministic Coral Reef Remote Sensing	2004-2006

***New Investigators***

**New Investigators Program**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Wildlife Conservation Society	Eric Sanderson	Monitoring of Large Wildlife Directly Through High Spatial Resolution Remote Sensing: Experimental and In Situ Approaches	2004-2006

***Other***

**EOS Recompensation**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Oregon State	Richard Waring	Predicting Tree Species Diversity Across the Contiguous U.S.A. from Seasonal Patterns in Photosynthesis Derived with Satellite-Driven Models	2004-2006

***Other***

**EOS Recompensation**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
NASA/GSFC	Jeffrey Morisette	Value Added Products from Vegetation and Precipitation Time-Series Data Sets in Support of Invasive Species Prediction	2004-2006

***Other***

**EOS Recompensation**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Montana State	Andrew Hansen	Testing Biophysical and Land Use Controls on Biodiversity Using MODIS and AMSR-E Products	2004-2006

**Other**

**EOS Recompetition**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of South Florida	Frank Muller-Karger	EAGLE-EYE: Ecological Assessment of Generalized Littoral Environments - an Integrated EOS DB/Real-Time MODIS Science Applications Project	2004-2006

**Research Projects**

**REASoN**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Michigan State University	David Skole	A Global Tropical Information Center	2003-2008

**Research Projects**

**REASoN**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Cal State Monterey Bay	Frederick Watson	Systems Integration and Visualization of Yellowstone	2003-2008

**Research Projects**

**REASoN**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Maryland	John Townshend	Global Land Cover Facility	2003-2008

***Fellowships*****Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of California Berkeley	Arnold, Benjamin	Using Remote Sensing to Investigate the Role of Environmental Change and Hydrological Connectivity in the Reemergence of Schistosomiasis in Sichuan Province, China	2006-2008

***Fellowships*****Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Central Florida	Amanda Cooper,	Detecting Changes in Vertical Canopy Structure of Tropical Rainforests Using LiDAR	2006-2008

***Fellowships*****Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Clark University	Rebecca Dickson	Evaluating Remote Sensing Techniques for the Discrimination of Secondary Forests and Their Biodiversity Potential	2006-2008

***Fellowships*****Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Hawaii Manoa	Timothy Edmonds	Quantifying and Predicting the Ecological Meltdown of a Unique Hawaiian Forest Ecosystem by an Invasive Alien N-fixing Tree: a Remote Sensing and Spatial Analysis Based Approach	2006-2008

**Fellowships****Earth Science Fellowships**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Virginia	Lyndon Estes	Reintroducing a Large Herbivore: a Remote Sensing and Modeling Approach to Determine the Mountain Bongo's ( <i>Tragelaphus eurycerus isaaci</i> ) Past and Present Critical Habitat	2006-2008

**Fellowships****Earth Sciences Fellowships**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Duke University	Scott Loarie	Remote Sensing and African Elephant Conservation on a Sub Continental Scale: Using Satellite Telemetry and Spectral Datasets to Model Resource Selection and Movements	2006-2008

**Fellowships****Earth Science Fellowships**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of Rhode Island	Colleen Mouw	Inversion of Sea Spectral Reflectance to Obtain Phytoplankton Community Size Structure: Methodology and Ecological Implications	2006-2008

**Fellowships****Earth Science Fellowships**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
University of California Los Angeles	Stephanie Pau	Predicting Species Richness of Hawaiian Dry Forest Using NDVI	2006-2008



### ***Fellowships***

#### **Earth Science Fellowships**

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Princeton University	Patrick Schultz	Application of Novel Satellite Observations of Phytoplankton Carbon Biomass and Growth Rates to Develop an Empirical Ocean Ecosystem Model	2006-2008

### ***Additional Award***

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Wisconsin	Volker Radeloff	Post-USSR Land Cover Change in Eastern Europe - Socioeconomic Forcings, Effects on Biodiversity, and Future Scenarios	2004-2006

### ***Decision Awards***

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
University of Maryland	Diane Davies	Global Fire Information for Resource Management	2006-2008

### ***Decision Awards***

<u><i>Institution</i></u>	<u><i>PI</i></u>	<u><i>Title/Subject</i></u>	<u><i>Timeframe</i></u>
Woods Hole Research Center	Nadine Laporte	Protected Areas Watch in the Albertine	2006-2008

**Decision Awards**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Cornell University	Andrew Pershing	Predicting Right Whale Distributions from Space	2006

**Decision Awards**

<u>Institution</u>	<u>PI</u>	<u>Title/Subject</u>	<u>Timeframe</u>
Yellowstone Ecological Research Center	Robert Crabtree	LISN: Integration into NISFS for EcoForecasting	2006

## E. Acronyms and Websites

### ACRONYMS:

AIRS	Airborne Infrared Sounder
ALI	Advanced Land Imager
AMSR-E	Advanced Microwave Scanning Radiometer-EOS (Japanese)
AMSU	Advanced Microwave Sounding Unit
ARC	Ames Research Center
ASTER	Advanced Spaceborne Thermal Emission and Reflectance Radiometer
AVHRR	Advanced Very High Resolution Radiometer
CAN	Cooperative Agreement Notice
CASA	Carnegie-Ames-Stanford Approach
CATHALAC	The Water Center for the Humid Tropics of Latin America and the Caribbean
CBD	Convention on Biological Diversity
CBFP	Congo Basin Forest Partnership
CCAD	Central American Commission for Environment and Development
CCSP	Climate Change Science Program
CENR	Committee on Environment and Natural Resources
CO2	Carbon Dioxide
DAAC	Distributed Active Archive Center (Data Active Archive Center)
DFRC	Dryden Flight Research Center
DHS	Department of Homeland Security
DOA	Department of Agriculture
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DSS	Decision Support Systems
DST	Decision Support Tool
ENSO	El Niño - Southern Oscillation
EO-1	Earth Observing-1
EOS	Earth Observing System
EPA	Environmental Protection Agency
EROS	Earth Resources Observation System
ESA	Ecological Society of America
ESE	Earth Science Enterprise
ESMF	Earth Science Model Framework
ETM+	Enhanced Thematic Mapper Plus
EVI	Enhanced Vegetation Index
EVVB	evaluation, verification, validation, and benchmark
FAO	Food and Agriculture Organization of the United Nations
FEA	Federal Enterprise Architecture
FIRMS	Fire Information for Resource Management System

FPAR	Fraction of Absorbed Photosynthetically Active Radiation
FWS	U.S. Fish and Wildlife Service
GCM	Global Climate Model
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GEOS	Global Earth Observation System of Systems
GIG	Global Information Grid
GIO	Geospatial Interoperability Office
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GOES	Geostationary Operational Environmental Satellite
GOS	Geospatial One Stop
GRC	Glenn Research Center
GRID	Graphic Retrieval and Information Display
GSFC	Goddard Space Flight Center
GYA	Greater Yellowstone Area
HYDROS	Hydrosphere State Mission
IABIN	Inter-American Biodiversity Information Network
IBPD	Integrated Budget and Performance Document
IUCN	World Conservation Union
IWGEO	Interagency Working Group on Earth Observations
JCSDA	Joint Center for Satellite Data Assimilation
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
LaRC	Langley Research Center
LIDAR	Light Detecting and Ranging
LST	Land Surface Temperature
MBC	Mesoamerican Biological Corridor
MFF	Marine Fisheries Forecasting
MISR	Multi-angle Imaging Spectroradiometer
MM5	Mesoscale Model
MOA	Memorandum of Agreement
MODIS	Moderate Resolution Imaging Spectroradiometer
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
MSS	Multi-Spectral Scanner (Landsat 1)
NASA HQ	NASA Headquarters
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCSE	National Council for Science and the Environment
NDVI	Normalized Difference Vegetation Index
NGO	Nongovernmental Organization
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-Orbiting Operational Environmental Satellite System

NPP	NPOESS Preparatory Project
NPS	National Park Service
NRA	NASA Research Announcement
NSF	National Science Foundation
NSSTC	NASA National Space Science and Technology Center
OES	Office of Earth Science
OMB	Office of Management and Budget
OSTP	Office of Science and Technology Policy
PAM	Protected Area Management
PART	Program Assessment Rating Tool
PI	Principal Investigator
QuikSCAT	Quick Scatterometer
R2O	Research to Operations Network
RAMS	Regional Atmospheric Modeling System
REASoN	Research, Education, and Applications Solutions Network
RS	Remote Sensing
SAR	Synthetic Aperture Radar
SBSTTA	Subsidiary Body on Scientific, Technical, and Technological Advice
SCB	Society for Conservation Biology
SeaWiFS	Sea-viewing Wide-Field-of-view Sensor
SERVIR	Regional Visualization and Monitoring System for Mesoamerica
SMD	Science Mission Directorate
SRTM	Shuttle Radar Topography Mission
SSC	Stennis Space Center
SSS	Sea, Surface, Salinity
SST	Sea Surface Temperature
SUNY	State University of New York
TERRA	1st EOS spacecraft
TM	Thematic Mapper
TOMS	Total Ozone Mapping Spectrometer
TOPEX/POSEIDON	Satellite from JPL with Five Instruments
TOPS	Terrestrial Observation & Prediction System
TRMM	Tropical Rainfall Measurement Mission
UCAR	University Corporation for Atmospheric Research
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
URF	University Research Foundation
USAID	United States Agency for International Development
USDA	US Department of Agriculture
USFS	US Forest Service
USGCRP	US Global Change Research Program
USGS	United States Geological Survey
V&V	Verification & Validation
VIRS	Visible Infrared Scanner
VIIRS	Visible/Infrared Imager/Radiometer Suite

WCMC

World Conservation Monitoring Centre

**WEBSITES:**

AIWG: <http://aiwg.gsfc.nasa.gov>

Applied Sciences Program: <http://science.hq.nasa.gov/earth-sun/applications>

DEVELOP: <http://develop.larc.nasa.gov>

Earth-Sun System Gateway (ESG): <http://esg.gsfc.nasa.gov/>

Earth-Sun Science System Components: <http://www.asd.ssc.nasa.gov/m2m>

NASA FY2005 Budget: <http://www.ifmp.nasa.gov/codeb/budget2005>

Research and Analysis Program: <http://science.hq.nasa.gov/earth-sun/science/>

Science Mission Directorate: <http://science.hq.nasa.gov>

Science Strategies: <http://science.hq/nasa.gov/strategy/>

<http://www.reefbase.org>